Date of Issue:
25 March 2014

SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

Product Identifier

SRM Number: 3144
SRM Name: Rhodium (Rh) Standard Solution
Other Means of Identification: Not applicable.

Recommended Use of This Material and Restrictions of Use

This Standard Reference Material (SRM) is intended for use as a primary calibration standard for the quantitative determination of rhodium. A unit of SRM 3144 consists of five 10 mL sealed borosilicate glass ampoules of an acidified aqueous solution prepared from high-purity ammonium hexachlororhodate (III). The solution contains hydrochloric acid at a volume fraction of approximately 10 %, equivalent to an amount-of-substance concentration (molarity) of approximately 1.2 mol/L (4 %).

Company Information

National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2300
Gaithersburg, Maryland 20899-2300

Telephone: 301-975-2200
FAX: 301-948-3730
E-mail: SRMMSDS@nist.gov
Website: http://www.nist.gov/srm

Emergency Telephone ChemTrec:
1-800-424-9300 (North America)
+1-703-527-3887 (International)

2. HAZARDS IDENTIFICATION

Classification

Physical Hazard:	Not classified.	
Health Hazard:	Skin Corrosion/Irritation	Category 1B
	Serious Eye Damage/Eye Irritation	Category 1

Label Elements

Symbol

Signal Word

DANGER

Hazard Statement(s)

H314	Causes severe skin burns and eye damage.

Precautionary Statement(s)

P260	Do not breathe fume, mists, vapors, or spray.
P264	Wash hands thoroughly after handling.
P280	Wear protective gloves, protective clothing, and eye protection.
P301 + P330 + P331	If swallowed: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	If on skin (or hair): Remove immediately all contaminated clothing. Rinse skin with water.
P304 + P340	If inhaled: Remove person to fresh air and keep comfortable for breathing.
P305 + P351 + P338	If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a doctor.
P363	Wash contaminated clothing before reuse.

P405 Store locked up.

P501 Dispose of contents and container according to local regulations.

Hazards Not Otherwise Classified: Not applicable.

Ingredients(s) with Unknown Acute Toxicity: Not applicable.

3. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Substance: Ammonium hexachlororhodate (III) in hydrochloric acid solution

Other Designations:
Hydrochloric acid (HCl; muriatic acid)
Rhodium trichloride [Rhodium chloride; rhodium (III) chloride; trichlororhodium]

NOTE: Ammonium hexachlororhodate (III) in hydrochloric acid solution forms a solvated rhodium trichloride salt. The health and physical hazard information provided in this SDS are for hydrochloric acid and rhodium trichloride. The actual effects of the solution may differ from the individual components.

Components are listed in compliance with OSHA's 29 CFR 1910.1200; for the actual values see the NIST Certificate of Analysis.

Hazardous Component(s)	CAS Number	EC Number (EINECS)	Nominal Mass Concentration (%)
Hydrochloric acid	7647-01-0	231-595-7	4
Rhodium trichloride	10049-07-7	233-165-4	0.2
Non-Hazardous Component(s)			
Water	7732-18-5	231-791-2	>94

4. FIRST AID MEASURES

Description of First Aid Measures:

Inhalation: If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration or oxygen by qualified personnel. Seek immediate medical attention.

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get immediate medical attention. Thoroughly clean and dry contaminated clothing before reuse. Destroy contaminated shoes.

Eye Contact: Immediately flush eyes, including under the eyelids with copious amounts of water for at least 15 minutes. Seek immediate medical attention.

Ingestion: Contact a poison control center immediately for instructions. Give water to rinse out mouth. Never give liquids to a person with reduced awareness or becoming unconscious. If vomiting occurs, keep head lower than hips to prevent aspiration. If not breathing, give artificial respiration by qualified personnel. Seek immediate medical attention.

Most Important Symptoms/Effects, Acute and Delayed: Acid burns to skin, eyes, and lungs.

Indication of any immediate medical attention and special treatment needed, if necessary: If any of the above symptoms are present, seek immediate medical attention.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Negligible fire hazard. See Section 9, "Physical and Chemical Properties" for flammability properties.

Extinguishing Media:
Suitable: Regular dry chemical, carbon dioxide, water, regular foam.
Unsuitable: None listed.

Specific Hazards Arising from the Chemical: Thermal decomposition products: hydrogen chloride, acid halides.

Special Protective Equipment and Precautions for Fire-Fighters: Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH approved self-contained breathing apparatus (SCBA).

NFPA Ratings (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)

Health = 3 Fire = 0 Reactivity = 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment; see Section 8, "Exposure Controls and Personal Protection".

Methods and Materials for Containment and Clean up: Do not touch spilled material. Notify safety personnel of spills. Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Isolate hazard area and deny entry.

7. HANDLING AND STORAGE

Safe Handling Precautions: Handle glass ampoules with care. See Section 8, "Exposure Controls and Personal Protection".

Storage: Store and handling in accordance with all current regulations and standards. Keep separated from incompatible substances (See Section 10 "Stability and Reactivity").

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits:

Hydrochloric acid:

NIOSH (REL):	7 mg/m^3; 5 ppm (Ceiling)
	75 mg/m^3; 50 ppm (IDLH)
ACGIH (TLV):	3 mg/m^3; 2 ppm (Ceiling)
OSHA (PEL):	7 mg/m^3; 5 ppm (Ceiling)

Rhodium trichloride: No occupational exposure limits established.

Engineering Controls: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Personal Protection: In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.

Respiratory Protection: If workplace conditions warrant a respirator, a respiratory protection program that meets OSHA 29CFR 1910.134 must be followed. Refer to NIOSH 42 CFR 84 for applicable certified respirators.

Eye/Face Protection: Wear splash resistant safety goggles with a face shield. An eyewash station should be readily available near areas of use.

Skin and Body Protection: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Chemical-resistant gloves should be worn at all times when handling chemicals.

9. PHYSICAL AND CHEMICAL PROPERTIES

NOTE: The physical and chemical data provided are for the pure hazardous components. No physical or chemical data are available for this solution of rhodium trichloride and hydrochloric acid.

Descriptive Properties:	**Hydrochloric acid (4 % of this SRM)**	**Rhodium trichloride (0.2 % of this SRM)**
Appearance (physical state, color, etc.):	colorless to yellow liquid	red deliquescent powder
Molecular Formula:	HCl	$RhCl_3$
Molar Mass (g/mol):	36.46	209.26
Odor:	not available	not available
Odor threshold:	not available	not available
pH:	<2	not applicable
Evaporation rate (ether = 1):	>1	not applicable
Melting point/freezing point (ºC):	not available	not available

	Hydrochloric acid (4 % of this SRM)	Rhodium trichloride (0.2 % of this SRM)
Descriptive Properties:		
Sublimation Point (ºC):	not applicable	800 (1472 ºF)
Decomposition (ºC):	not applicable	450 to 500 (842 ºF to 932 ºF)
Relative Density as specific gravity (water = 1):	1.0 to 1.2	not available
Vapor Pressure:	14 mmHg (20 ºC)	not applicable
Vapor Density (air = 1):	not available	not applicable
Viscosity (cP):	not available	not applicable
Solubility(ies):	miscible with water	soluble in alkali solutions, cyanide solutions, water; insoluble in alkali solutions, cyanide solutions
Partition coefficient (n-octanol/water):	not available	not available
Thermal Stability Properties:		
Autoignition Temperature (ºC):	not applicable	not applicable
Thermal Decomposition (ºC):	not applicable	not available
Initial boiling point and boiling range (ºC):	not available	not applicable
Explosive Limits, LEL (Volume %):	not applicable	not applicable
Explosive Limits, UEL (Volume %):	not applicable	not applicable
Flash Point (ºC):	not applicable	not applicable
Flammability (solid, gas):	not applicable	not applicable

10. STABILITY AND REACTIVITY

Reactivity: Stable at normal temperatures and pressure.

Stability: X Stable _____ Unstable

Possible Hazardous Reactions: May react with evolution of heat; release toxic, corrosive, flammable or explosive gases on contact with water.

Conditions to Avoid: Heat, flames, sparks and other sources of ignition. May ignite or explode on contact with combustible materials.

Incompatible Materials: Cyanides, metals, amines, bases, metal carbide, oxidizing materials, acids, halo carbons, combustible materials, halogens, metal salts.

Fire/Explosion Information: See Section 5, "Fire Fighting Measures".

Hazardous Decomposition: Thermal decomposition will produce hydrogen chloride gas, chlorine.

Hazardous Polymerization: _____ Will Occur X Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Exposure: X Inhalation X Skin _____ Ingestion

Symptoms Related to the Physical, Chemical and Toxicological Characteristics: Burning pain, severe skin corrosion, and eye damage.

Potential Health Effects (Acute, Chronic and Delayed):

Inhalation: Inhalation of hydrochloric acid can damage the mucous membranes and upper respiratory tract. Short term exposure may cause irritation and inflammation of the upper respiratory tract, coughing, choking, sore throat, shortness of breath, headache, dizziness, and nausea. Long term exposure to acid fumes may cause damage to teeth, bronchial irritation, chronic cough, bronchial pneumonia, and gastrointestinal disturbances. No irritant or systemic effects have been observed from exposure to rhodium or its insoluble salts.

Skin Contact: Hydrochloric acid can cause severe skin burns. Severity of the damage depends on the concentration and duration of exposure. Effects of acid burns may be delayed. Rhodium salts may cause irritation.

Eye Contact: Hydrochloric acid can cause severe eye irritation, corneal burns, permanent eye damage, or blindness. Severity of the damage depends on the concentration and duration of exposure. Acute exposure to rhodium may cause irritation.

Ingestion: If ingested, concentrated hydrochloric acid can cause burns to the gastrointestinal tract. No information on significant adverse effects for rhodium trichloride.

Numerical Measures of Toxicity:

Acute Toxicity: Not classified.
Hydrochloric acid: Rat, Inhalation LC50: 3124 ppm (1 h); 1562 ppm (4 h)
Hydrochloric acid: Rat, Oral LD50: 700 mg/kg

Rhodium trichloride: Rat Oral LD50: 1302 mg/kg

Skin Corrosion/Irritation: Category 1B
This SRM contains >1 % hydrochloric acid and it is classified as Category 1B.

Rhodium trichloride: No data available.

Serious Eye damage/Eye irritation: Category 1
This SRM contains >1 % hydrochloric acid and it is classified as Category 1.

Rhodium trichloride: A 0.1 M solution applied for 10 minutes to denuded rabbit eyes caused temporary orange discoloration to the cornea and a delayed injurious reaction. During the first two to three weeks the cornea was slightly hazy; the third week, white opacities gradually developed; and ultimately, the cornea became extensively opacified and vascularized.

Respiratory Sensitization: No data available.

Skin Sensitization: No data available.

Germ Cell Mutagenicity: No data available.

Carcinogenicity: Not classified.
Listed as a Carcinogen/Potential Carcinogen _____ Yes X No
Hydrochloric acid is not listed by NTP, IARC or OSHA as a carcinogen.
Rhodium trichloride is not listed by NTP, IARC or OSHA as a carcinogen.

Reproductive Toxicity: Not classified.
Hydrochloric acid: Rat, Oral TDLo: 450 mg/kg (1 h, prior to copulation 1 d)
Rhodium trichloride: Rat, Intratesticular TDLo: 16 741 ug/kg (1 d)

Specific Target Organ Toxicity, Single Exposure: Not classified.

Specific Target Organ Toxicity, Repeated Exposure: Not classified.

Aspiration Hazard: No data available.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data:

Hydrochloric acid:
Fish Toxicity: Mosquitofish (*Gambusia affinis*) LC50 (static): 282 mg/L (96 h)
Invertebrate: Shore crab (*Carcinus maenas*) LC50 (mortality): 240 mg/L (48 h)

Rhodium trichloride: No ecotoxicity data available.

Persistence and Degradability: No data available.

Bioaccumulative Potential: No data available.

Mobility in Soil: Hydrogen chloride will evaporate from dry soil surfaces and dissociate into chloride and hydronium ions in moist soil.

Other Adverse effects: No data available.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose of waste in accordance with all applicable federal, state, and local regulations. Hydrochloric acid subject to disposal regulations: U.S. EPA 40 CFR 262, Hazardous Waste Number: D002.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: UN1760, Corrosive liquid, n.o.s. (contains hydrochloric acid), Hazard Class 8, Packing Group II, Excepted Quantities E2.

15. REGULATORY INFORMATION

U.S. Regulations:

CERCLA Sections 102a/103 (40 CFR 302.4): Hydrochloric acid, 5000 lbs (2270 kg) final RQ.

SARA Title III Section 302 (40 CFR 355.30): Hydrochloric acid, 500 lbs (227 kg) TPQ (gas only).

SARA Title III Section 304 (40 CFR 355.40): Hydrochloric acid, 5000 lbs (2270 kg) EPCRA RQ (gas only).

SARA Title III Section 313 (40 CFR 372.65): Hydrochloric acid, 1.0 % de minimis concentration (acid aerosols including mists, vapors, gas, for, and other airborne forms of any particle size).

OSHA Process Safety (29 CFR 1910.119): Hydrochloric acid, 5000 lb TQ (anhydrous).

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE HEALTH:	Yes.
CHRONIC HEALTH:	No.
FIRE:	No.
REACTIVE:	No.
PRESSURE:	No.

State Regulations:

California Proposition 65: Not listed.

U.S. TSCA Inventory: Hydrochloric acid and rhodium trichloride are listed.

TSCA 12(b), Export Notification: Not listed.

Canadian Regulations:

WHMIS Information: Not provided for this material.

16. OTHER INFORMATION

Issue Date: 25 March 2014

Sources: ChemAdvisor, Inc., MSDS *Hydrochloric Acid*, 07 February 2014.

ChemAdvisor, Inc., MSDS *Rhodium Trichloride*, 23 December 2013.

Hazardous Substances Data Bank, National Library of Medicine, *Hydrochloric Acid CAS 7647-01-0*, Animal Toxicity Studies, available at http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB (accessed March 2014).

NIOSH Pocket Guide to Chemical Hazards, *Hydrochloric Acid CAS 7647-01-0*, available at http://www.cdc.gov/niosh/npg/npgd0332.html (accessed March 2014).

Key of Acronyms:

ACGIH	American Conference of Governmental Industrial Hygienists	NRC	Nuclear Regulatory Commission
ALI	Annual Limit on Intake	NTP	National Toxicology Program
CAS	Chemical Abstracts Service	OSHA	Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Level
CFR	Code of Federal Regulations	RCRA	Resource Conservation and Recovery Act
DOT	Department of Transportation	REL	Recommended Exposure Limit
EC50	Effective Concentration, 50%	RM	Reference Material
EINECS	European Inventory of Existing Commercial Chemical Substances	RQ	Reportable Quantity
EPCRA	Emergency Planning and Community Right-to-Know Act	RTECS	Registry of Toxic Effects of Chemical Substances
IARC	International Agency for Research on Cancer	SARA	Superfund Amendments and Reauthorization Act
IATA	International Air Transportation Agency	SCBA	Self-Contained Breathing Apparatus
IDLH	Immediately Dangerous to Life and Health	SRM	Standard Reference Material
LC50	Lethal Concentration, 50 %	STEL	Short Term Exposure Level
LD50	Lethal Dose, 50 %	TLV	Threshold Limit Value
LEL	Lower Explosive Limit	TPQ	Threshold Planning Quantity
MSDS	Material Safety Data Sheet	TSCA	Toxic Substances Control Act
NFPA	National Fire Protection Association	TWA	Time Weighted Average
NIOSH	National Institute for Occupational Safety and Health	UEL	Upper Explosive Limit
NIST	National Institute of Standards and Technology	WHMIS	Workplace Hazardous Materials Information System
n.o.s.	Not Otherwise Specified		

Disclaimer: Physical and chemical data contained in this SDS are provided only for use in assessing the hazardous nature of the material. The SDS was prepared carefully, using current references; however, NIST does not certify the data in the SDS. The certified values for this material are given in the NIST Certificate of Analysis.

Users of this SRM should ensure that the SDS in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at http://www.nist.gov/srm.